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ABSTRACT

In 1988-89 the Connecticut Vocational-Technical School System initiated a program for the ongoing review and upgrading of all trade and academic curricula use in the system's 17 schools to insure that each curriculum is consistent with current standards. Every 3 years the Curriculum Steering Committee for the trade or academic subject conducts a review and an analysis to identify outdated content, approaches, or materials. The revised curriculum incorporates the latest thinking of instructors who teach the subject, suggestions from authorities in the mathematics field, and current instructional approaches in the field of education. This curriculum is intended as a plan for learning geometry and an aid to the mathematics instructor to prepare students for membership in society. The document is separated into several sections: the Vocational-Technical School System Mathematics Sequence; Career Relationships and Requirements; Professional Goals for Instructors; General Competencies for Students; Personal Competencies for Students; Correlations of Trade/Subject Competencies with Connecticut's Common Core of Learning (a chart); and a series of 12 geometry units. Each unit provides suggested instructional time, unit objectives, and a list of competencies required of students after completing the unit. The units are: (1) Points, Lines, Planes, Angles; (2) Deductive Reasoning; (3) Parallel Lines and Planes; (4) Congruent Triangles; (5) Quadrilaterals; (6) Similar Polygons; (7) Right Triangles; (8) Circles; (9) Constructions and Loci; (10) Areas of Plane Figures; (11) Areas and Volumes of Solids; and (12) Coordinate Geometry. Twenty-two computer software and 2 textbook citations are provided in the appendixes, as well as a detailed outline of the Common Core of Learning. (MDH)

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VT-605

GEOMETRY

VOCATIONAL-TECHNICAL SCHOOL SYSTEM
CONNECTICUT DEPARTMENT OF EDUCATION

1989

1991 REVISION

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GEOMETRY

CURRICULUM

PREPARED BY EASTCONN
ROUTE 6 (HAMPTON)
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PREPARED FOR:

CONNECTICUT STATE DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL, TECHNICAL AND ADULT EDUCATION
VOCATIONAL-TECHNICAL SCHOOL SYSTEM
MIDDLETOWN, CONNECTICUT

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1989

1121N

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FOREWORD

In 1988-89, the Connecticut Vocational-Technical School System initiated a program for the ongoing review and upgrading of all trade and academic curricula used in the System's seventeen schools. Each curriculum is first reviewed by the appropriate Curriculum Steering Committee during the third year following its last revision. The Curriculum Steering Committee for the trade or academic subject conducts a review and analysis to identify any outdated content, approaches, and materials. Any deficiencies are noted. During the following year a sub-committee of the Steering Committee prepares a revision of the curriculum incorporating all necessary changes.

This publication is the result of such a process. The curriculum incorporates the latest thinking of Instructors who teach this subject, suggestions from authorities in the mathematics field, and the best instructional approaches in the field of vocational-technical education.

Special appreciation is extended to the Instructors who provided input prior to the beginning of the curriculum revision. We also appreciate the suggestions and significant contribution of Ronald E. Brann, Consultant, Connecticut State Department of Education, Division of Vocational, Technical and Adult Education, Vocational-Technical School System.

Jerry C. Bencivenga, Consultant
Vocational-Technical School System

John Bruno, Steering Committee Chairman
August 1989

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INTRODUCTION

The following curriculum is intended as a plan for learning and an aid to the Instructor whose responsibility it is to teach mathematics and to prepare students for involved and productive membership in society. The curriculum document consists of several sections. Each of the sections is explained below.

Career Relationships and Requirements. The Instructor is the key person in the student's preparation for adult society. This section of the curriculum reminds the Instructor of some career related informational sources which should be shared with the students.

Common Core of Learning (CCL). Each of the General and Personal Competencies for Students directly relates to a component of Connecticut's Common Core of Learning. However, the instruction and experiences which are provided to assist a student toward achievement of a competency may address other CCL components in varying degrees. The CCL Matrix illustrates the full range of CCL components which are effected. Instructors should refer to the complete list of CCL components found in the Appendices.

Instructor's Goals. These are the competencies expected of every successful student in the program. Competencies are stated in terms of expected student outcomes. All subsequent instructional decisions should show a relationship to one or more of these competencies.

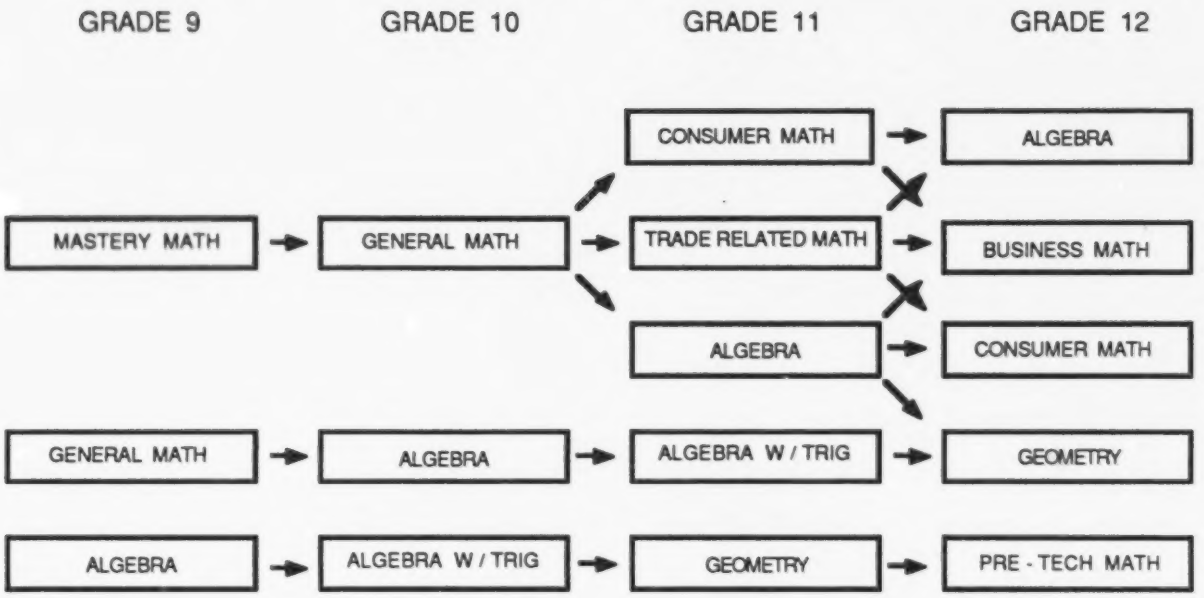
Personal Competencies for Students. A successful citizen and tradesperson becomes such through the mastery of essential knowledge and skills plus the internalization of positive attitudes and values. "Personal Competencies for Students" calls attention to some behaviors which should be demonstrated by responsible citizens.

Course Outline. Course content, specific objectives, and related activities are organized into coherent blocks of instruction. They may be called units or they may simply be identified by a designated period of time. Contained within each block are the differentiated Student Competencies and an outline of the essential content necessary for achievement of them. The units contain suggested activities and suggested approaches to assessment. In all cases, they are suggestions not prescriptions. The Instructor is expected to commit to the goals and competencies but alternative means may be employed to achieve them.

Appendices. The appendices offer brief lists of resources appropriate to the successful completion of the program. In addition to the obvious use of these pages, the Instructor may refer to the appendices when ordering supplies.

VTSS

MATHEMATICS SEQUENCE



All voc-tech schools should schedule math students by ability. When students need to learn a new math skill out of sequence for use in their shop, the shop instructor should teach it during theory.

We encourage our students to challenge themselves with advanced course work to stretch the limits of their ability and not just accept minimum achievement as a goal.

In addition, scheduled computer-assisted math is available in all schools to tutor students in need.

Finally, students should not be tracked in any one sequence. Any students showing success in a mathematics course should be considered for advanced courses. For this reason, classes are not limited to a single grade .

3-17-89

CAREER RELATIONSHIPS AND REQUIREMENTS

Successful completion of this course provides a student with the basic understanding of the math skills needed to enhance their career. The student should also have an understanding and appreciation of the vital role of mathematics in everyday transactions. Through this knowledge, the student will benefit as a worker, consumer or business person, and will be a more productive citizen. The mathematical principles constitute a foundation on which the student can continue to learn and add to their individual knowledge. Students who wish to consider career options in mathematics should be encouraged to consult the Connecticut Information System (COIS) and the Occupational Outlook Handbook (United States Department of Labor) to identify related occupations and their requirements.

PROFESSIONAL GOALS FOR INSTRUCTORS

The Instructor will:

1. Plan learning experiences which consist of a logical introduction, sufficient development and guided practice for basic understanding and a summarizing conclusion.

2. Select delivery strategies which take into account the different interests, abilities, learning styles, and expectations of Vocational-Technical School students.

3. Plan and present lessons that demonstrate how mathematics relates to the student's selected vocation or trade area.

4. Plan instruction geared to ability levels of the students in each class.

5. Employ a variety of instructional techniques.

6. Use a variety of evaluative tools and techniques.

7. Encourage students to use their creativity and initiative.

8. Present learning experiences in such a way as to elicit higher-level thinking and critical thinking.

GENERAL COMPETENCIES FOR STUDENTS

The Student will:

1. State the basic geometric definitions, postulates, and theorems.
2. Distinguish between the various types of angles used in geometry.
3. Identify parallel and perpendicular lines.
4. State the rules of congruency for triangles.
5. Apply the theorems of congruency to quadrilaterals.
6. Apply the properties of proportion to similar polygons.
7. Use the Pythagorean Theorem to solve problems involving right triangles.
8. Use the trigonometric ratios to find missing sides and angles in right triangles.
9. Determine the measure of line segments, arcs, and angles in connection with the circle.
10. Execute the basic constructions of geometry with a ruler, a straight edge and a compass.
11. Apply the formula for the area of polygons and the area and volume of solids.
12. State the distance formulas and the slope formula.
13. Write the equation of a line given two points or a point and the slope.
14. Understand how mathematics relates to the student's selected vocation or trade area.

PERSONAL COMPETENCIES FOR STUDENTS

The student will demonstrate a willingness to:

1. Do assigned tasks without constant supervision (A/A C.3).
2. Work as a team member and assist others (A/A E.3).
3. Observe safety rules (A/A C.2).
4. Maintain books, equipment and/or work stations (A/A F.2).
5. Contribute to maintaining a positive educational environment within the classroom.

CORRELATIONS OF TRADE/SUBJECT COMPETENCIES
WITH CONNECTICUT'S COMMON CORE OF LEARNING

LIST OF STUDENT COMPETENCIES OR ANTICIPATED OUTCOMES	RELATED COMMON CORE OF LEARNING COMPONENTS		
TRADE/SUBJECT: GEOMETRY	ATTITUDES AND ATTRIBUTES	SKILLS AND COMPETENCIES	UNDERSTANDINGS AND APTITUDES
Be able to state the basic geometric definitions, postulates, and theorems.		D4	
Be able to distinguish between the various types of angles used in geometry.		D2	
Be able to identify parallel and perpendicular lines.		D4	
Be able to state the rules of congruency for triangles.		D4	
Be able to apply the theorems of congruency to quadrilaterals.		D4	F4, F7
Be able to apply the properties of proportion to similar polygons.		D4	F7
Be able to use the pythagorean theorem to solve problems involving right triangles.		E1,E4,E6, E7,E8,E9	F4, F7
Be able to use the trigonometric ratios to find missing sides and angles in right triangles.		E4,E7	F4, F7
Be able to determine the measure of line segments, arcs, and angles in connection with the circle.		D2,E8	F6, F7
Be able to execute the basic constructions of geometry with a ruler, a straight edge and a compass.		D2, D4	
Be able to apply the formula for the area of polygons and the area and volume of solids.		D2,D4,E7 E8,E9	F4, F7
Be able to state the distance formulas and the slope formula.		D4	
Be able to write the equation of a line given two points or a point and the slope.		D4,E6	F1
Understand how mathematics relates to the student's selected vocation or trade area.	A3, D3	F1	B3,B4,B5, B6,F2,F3

UNIT I

POINTS, LINES, PLANES AND ANGLES

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to understand some basic relationships among points, lines, and planes. They should be able to identify some basic geometric terminology and notation. Students should be able to label angles and measure them and also add angles as well as line segments.

Student Competencies:

After completing this unit, all students should be able to:

1. Use the undefined terms point, line, and plane, and draw representations of each.
2. Use the terms co-linear, co-planar and intersection.
3. Use symbols for lines, segments, rays and distances.
4. Find distances and use the term equidistant.
5. Add line segments.
6. Add angles.
7. Read a diagram and recognize what can be concluded from a diagram.
8. Identify congruent line segments and angles.

Level I students will, in addition:

1. Use postulates and theorems relating to points, lines, and planes.
2. Make an accurate drawing of parallel planes, intersecting planes, and the intersection of lines and planes.
3. Accurately describe drawings of parallel planes, intersecting planes, and the intersection of lines and planes.

UNIT II

DEDUCTIVE REASONING

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to understand deductive reasoning and the deductive method of writing proofs. Emphasis is placed on both geometric and algebraic properties which can be applied to simple proofs.

Student Competencies:

After completing this unit, all students should be able to:

1. Recognize the hypothesis and conclusion of an "if-then" statement.
2. Understand the meaning of "if" and "only if".
3. Use the Midpoint Theorem and Angle Bisector Theorem.
4. Know the kinds of reasons that can be used in proofs.
5. Apply the definitions of complementary, supplementary and vertical angles.
6. Apply the definition and theorems about perpendicular lines.
7. State and apply the theorems about angles supplementary to, or complementary to congruent angles.

Level I students will, in addition:

1. Plan proofs and write them in two-column form.
2. State the converse of an "if-then" statement.
3. Use a counter example to disprove an "if-then" statement.

UNIT III

PARALLEL LINES AND PLANES

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to understand the properties of parallel lines and planes and the angles which have a relationship to them. They will extend this knowledge to triangles and their angle relationships.

Student Competencies:

After completing this unit, all students should be able to:

1. Distinguish between intersecting lines and parallel lines.
2. Identify the angles formed by two parallel lines being cut by a transversal.
3. State and apply the postulate and theorems about parallel lines.
4. State and apply the theorems about a parallel and a perpendicular to a given line through a point outside the line.
5. Classify triangles according to sides and angles.
6. State and apply the theorem and corollaries about the sum of the measures of the angles of a triangle.
7. State and apply the theorem about the measure of an exterior angle of a triangle.
8. Recognize and name convex polygons and regular polygons.
9. Find the measures of interior angles and exterior angles of convex polygons.
10. Understand and use inductive reasoning.

Level I students will, in addition:

1. Write proofs involving parallel lines, perpendicular lines, triangles and convex polygons.

UNIT IV

CONGRUENT TRIANGLES

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to understand the principle of congruency and have an intuitive sense for the concepts of same size and shape. The rules for congruency are presented and the student should also develop the skill of looking at diagrams carefully and making visual judgements about which figures seem to be congruent.

Student Competencies:

After completing this unit, all students should be able to:

1. Identify the corresponding parts of a figure.
2. State and apply the SSS Postulate, the SAS Postulate, and the ASA Postulate of congruent triangles.
3. Deduce information about segments and angles after proving that two triangles are congruent.
4. Apply the theorems and corollaries about isosceles triangles.
5. Use the AAS theorem to prove two triangles congruent.
6. Use the HL theorem to prove two right triangles congruent.
7. Prove that two overlapping triangles are congruent.
8. Apply the definition of the median and the altitude of a triangle and the perpendicular bisector of a segment.
9. State and apply the theorem about a point on the bisector of an angle.

Level I students will, in addition:

1. Write logical proofs involving congruency.

UNIT V

QUADRILATERALS

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to recognize and be able to sketch the different kinds of quadrilaterals. Students should also be able to state and apply the properties that are unique to each type of quadrilateral.

Student Competencies:

After completing this unit, all students should be able to:

1. Apply the definition of a parallelogram and the theorems about properties of a parallelogram.

2. Apply theorems about parallel lines.

3. Apply the midpoint theorems for triangles.

4. Apply the definitions and identify the special properties of a rectangle, a rhombus, and a square.

5. Determine when a parallelogram is a rectangle, rhombus or square.

6. Apply the definitions and identify the properties of a trapezoid and an isosceles trapezoid.

Level I students will, in addition:

1. Write logical proofs involving quadrilaterals.

UNIT VI

SIMILAR POLYGONS

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to understand the relation of similarity as compared to equality and congruence.

Student Competencies:

After completing this unit, all students should be able to:

1. Express a ratio in simplest form.
2. Solve for an unknown term in a given proportion.
3. State and apply the properties of similar polygons.
4. Use the AA Similarity Postulate to show triangles similar.
5. Use similar triangles to deduce information about segments or angles.
6. Apply the triangle proportionality theorem and its corollary.
7. State and apply the triangle angle-bisector theorem.

Level I students will, in addition:

1. Use the AA Similarity Postulate to prove triangles similar.
2. Use the SAS Similarity Theorem and the SSS Similarity Theorem to prove triangles similar.

UNIT VII

RIGHT TRIANGLES

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to find any missing dimension of a right triangle. The unit begins with the similarities produced when the altitude is drawn to the hypotenuse of a right triangle. The various geometric means found in these similarities are developed along with the algebraic techniques with radicals that will be needed throughout the unit. The trigonometric ratios of sine, cosine and tangent are also presented.

Student Competencies:

After completing this unit, all students should be able to:

1. Determine the geometric mean between two numbers.
2. State and apply the Pythagorean Theorem.
3. State and apply the converse of the Pythagorean Theorem and related theorems about obtuse and acute triangles.
4. Determine the lengths of two sides of a $45^{\circ} - 45^{\circ} - 90^{\circ}$ triangle when the length of the third side is known.
5. Recognize whether three numbers can be the lengths of the sides of a right triangle.
6. Define the tangent ratio for an acute angle.
7. Solve right triangle problems by using the tangent ratio.
8. Define the sine and cosine ratios for an acute angle.
9. Solve right triangle problems by using the sine and cosine ratios.
10. Solve right triangle problems by correct selection and use of the tangent, sine and cosine ratios.

Level I students will, in addition:

1. Write logical proofs involving squares, square roots and the Pythagorean Theorem.
2. Recognize whether a square root expression in the form x is in simplest radical form.
3. Solve three-dimensional problems involving trigonometry.

UNIT VIII

CIRCLES

Suggested Instructional Time: 5 Days

Unit Objective: This unit will enable students to understand the basic geometric terminology and notation associated with angles and circles and the arcs of a circle. Procedures for measuring arcs and angles will be presented as well as the special relationships between angles and arcs. Congruent and concentric circles are defined, and the concepts of an inscribed polygon and a circumscribed circle are introduced.

Student Competencies:

After completing this unit, all students should be able to:

1. Define a circle, a sphere, and terms related to them.
2. Recognize inscribed polygons and circumscribed circles.
3. Apply theorem that relates tangents and radii.
4. Recognize circumscribed polygons and inscribed circles.
5. Define and apply properties of arcs and central angles.
6. Apply theorems about chords of a circle.
7. Solve problems involving inscribed angles.
8. Solve problems involving angles formed by chords, secants and tangents.
9. Solve problems involving lengths of chords, secant segments and tangent segments.

Level I students will, in addition:

1. Prove statement involving inscribed angles.
2. Prove statement involving angles formed by chords, secants and tangents.

UNIT IX

CONSTRUCTIONS AND LOCI

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to execute the basic constructions associated with geometry. The concept of locus is introduced and the student should understand locus problems having one condition.

Student Competencies:

After completing this unit, all students should be able to:

1. Construct a line segment congruent to a given line segment.
2. Construct a triangle, given the lengths of its side.
3. Construct an angle congruent to a given angle.
4. Construct an angle bisector.
5. Construct a triangle, given two sides and the included angle or two angles and the included side.
6. Construct the perpendicular bisector of a line segment, the perpendicular to a line at a point on the line, and the perpendicular to a line from a point outside the line.
7. State and apply theorems involving concurrent lines.
8. Identify tangent lines and points of tangency for a circle.
9. Draw all common tangents for a given pair of circles.
10. Describe a locus that satisfies a given condition.

Level I students will, in addition:

1. Describe the locus that satisfies more than one given condition.
2. Apply the concept of locus in the solution of construction exercises.
3. Construct a nine-point circle.

UNIT X

AREAS OF PLANE FIGURES

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to understand the meaning of area. Emphasis should be on understanding the concept of the area of a plane figure and not just substitutions in formulas.

Student Competencies:

After completing this unit, all students should be able to:

1. Understand what is meant by the area of a polygon.
2. Understand the area postulates.
3. Know and use the formula for the area of a rectangle.
4. Know and use the formula for the area of a trapezoid.
5. Know and use the formulas for the areas of regular polygons.
6. Know and use the formulas for the areas of parallelograms, triangles, and rhombuses.
7. Know and use the formulas for the circumferences and areas of circles that are derived from the perimeter and area formulas for regular polygons.
8. Know and use the formulas for arc lengths and the areas of sectors of a circle.
9. Find the ratio of the areas of two triangles.
10. Understand and apply the relationship between scale factors, perimeters, and areas of similar figures.

Level I students will, in addition:

1. Use areas to solve problems involving geometric probability.
2. Complete the steps in the proofs which are presented with only key steps provided.
3. Compare the areas of figures using ratios.

UNIT XI

AREAS AND VOLUMES OF SOLIDS

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to understand the procedures for determining the total area, lateral area, and volume of right prisms, right circular cylinders, right cones, pyramids, spheres and similar solids.

Student Competencies:

After completing this unit, all students should be able to:

1. Identify the parts of prisms.
2. Find the lateral areas, total areas, and volumes of right prisms.
3. Identify the parts of pyramids.
4. Find the lateral areas, total areas, and volumes of regular pyramids.
5. Find the lateral areas, total areas, and volumes of right cylinders, and right cones.
6. Find the area and volume of a sphere.
7. State and apply the properties of similar solids.

Level I students will, in addition:

1. Prove postulates involving volumes and lateral areas.
2. Solve problems of applications of volumes and lateral areas.

UNIT XII

COORDINATE GEOMETRY

Suggested Instructional Time: 10 Days

Unit Objective: This unit will enable students to understand coordinate systems and the use of coordinates. Among the topics studied are the distance formula, slope of a line, vectors, the midpoint formula and graphing a straight line by the slope-y-intercept form.

Student Competencies:

After completing this unit, all students should be able to:

1. State and apply the distance formula.
2. State and apply the general equation of a circle.
3. State and apply the slope formula.
4. Determine whether two lines are parallel, perpendicular or neither.
5. Understand the basic properties of vectors.
6. State and apply the midpoint formulas.
7. Identify the slope and y-intercept of the line specified by a given equation.
8. Draw the graph of a line specified by a given equation.
9. Determine the intersection of two lines.
10. Write the equation of a line when given either one point and the slope of the line, or two points on the line.

Level I students will, in addition:

1. Prove statements using coordinate geometry methods.
2. Given a polygon, choose a convenient placement of coordinate axes and assign appropriate coordinates.
3. Prove the midpoint formula by using vectors.

APPENDIX A

Computer Resource Software

Item	Software		Computer
1.	Math Blaster		Mac
2.	Math Blaster Plus		Apple IIGS/IIe
3.	Algablaster		Apple IIGS
4.	Simple Accounting		Mac
5.	Math Talk		Mac
6.	Jumping Math Flash		Apple IIGS
7.	Math Type		Mac
8.	MacDraft		Mac
9.	Pict-O-Graph		Mac
10.	Geometry		Mac
11.	Calculus		Mac
12.	Problem Solving in Algebra Intro and	Lessons 1 - 7	Apple II GS/IIe
13.	Problem Solving in Algebra	Lessons 8 - 14	Apple II GS/IIe
14.	Problem Solving in Algebra	Lessons 15 - 21	Apple II GS/IIe
15.	Problem Solving in Algebra	Lessons 22 - 30	Apple II GS/IIe
16.	Problem Solving in Algebra	Lessons 31 - 38	Apple II GS/IIe
17.	Geometry - Funky Chicken		Apple II GS/IIe
18.	Geometry - Exploring Triangles		Apple II GS/IIe
19.	Estimation - Estimation Invasion		Apple II GS/IIe
20.	Estimation - Round Up, Round Down		Apple II GS/IIe
21.	Math Skills - Junior High Level		Apple II GS/IIe
22.	Math Skills - Elementary Level		Apple II GS/IIe

APPENDIX B

RECOMMENDED TEXTBOOKS

Cox, Philip L. Geometry - An Informal Approach. Newtown, Massachusetts: Allyn and Bacon, Inc., 1986.

Jurgensen, Ray C. et. al. Geometry. Boston, Massachusetts: Houghton Mifflin Company, 1990.

APPENDIX C

COMMON CORE OF LEARNING

(A/A) Attributes and Attitudes

(A) Positive Self-Concept

As part of education in grades K-12, each student should be able to:

1. Appreciate his/her worth as a unique and capable individual and exhibit self-esteem;

2. Develop a sense of personal effectiveness and a belief in his/her ability to shape his/her future;

3. Develop an understanding of his/her strengths and weaknesses and the ability to maximize strengths and rectify or compensate for weaknesses.

(B) Motivation and Persistence

As part of education in grades K-12, each student should be able to:

1. Experience the pride of accomplishment that results from hard work and persistence;

2. Act through a desire to succeed rather than a fear of failure, while recognizing that failure is a part of everyone's experience;

3. Strive toward and take the risks necessary for accomplishing tasks and fulfilling personal ambitions.

(C) Responsibility and Self-Reliance

As part of education in grades K-12, each student should be able to:

1. Assume the primary responsibility for identifying his/her needs and setting reasonable goals;

2. Initiate actions and assume responsibility for the consequences of those actions;

3. Demonstrate dependability;

4. Demonstrate self-control.

(D) Intellectual Curiosity

As part of education in grades K-12, each student should be able to:

1. Demonstrate a questioning attitude, open-mindedness and curiosity;

2. Demonstrate independence of thought necessary for leadership and creativity;

3. Pursue lifelong learning.

(E) Interpersonal Relations

As part of education in grades K-12, each student should be able to:

1. Develop productive and satisfying relationships with others based upon mutual respect;

2. Develop a sensitivity to and an understanding of the needs, opinions, concerns and customs of others;

3. Participate actively in reaching group decisions;

4. Appreciate the roles and responsibilities of parents, children and families.

(F) Sense of Community

As part of education in grades K-12, each student should be able to:

1. Develop a sense of belonging to a group larger than friends, family and co-workers;

2. Develop an understanding of the importance of each individual to the improvement of the quality of life for all in the community;

3. Examine and assess the values, standards and traditions of the community;

4. Understand and appreciate his/her own historical and ethnic heritage as well as that of others represented within the larger community.

(G) Moral and Ethical Values

As part of educa*ion in grades K-12, each student should be able to:

1. Recognize the necessity for moral and ethical conduct in a society;

2. Recognize that values affect choices and conflicts;

3. Develop personal criteria for making informed moral judgments and ethical decisions.

(S/C) Skills and Competencies

(A) Reading

As a result of education in grades K-12, each student should be able to:

1. Identify and comprehend the main and subordinate ideas, details and facts in written work and summarize the ideas in his/her own words;

2. Identify, comprehend and infer comparisons, contrasts, sequences and conclusions in written work;

3. Recognize different purposes and methods of writing, identify a writer's point of view and tone, and interpret a writer's meaning inferentially as well as literally;

4. Set purposes, ask questions and make predictions prior to and during reading and draw conclusions from reading;

5. Make critical judgments about written work including separating fact from opinion, recognizing propaganda, stereotypes and statements of bias, recognizing inconsistency and judging the validity of evidence and sufficiency of support;

6. Vary his/her reading speed and method based on the type of material and the purpose for reading;

7. Use the features of books and other reference materials, such as table of contents, preface, introduction, titles and subtitles, index, glossary, appendix and bibliography.

(B) Writing

As a result of education grades K-12, each student should be able to:

1. Write standard English sentences with correct sentence structure, verb forms, punctuation, capitalization, possessives, plural forms, word choice and spelling;

2. Select, organize and relate ideas and develop them in coherent paragraphs;

3. Organize sentences and paragraphs into a variety of forms and produce writing of an appropriate length using a variety of composition types;

4. Use varying language, information, style and format appropriate to the purpose and the selected audience;

5. Conceive ideas and select and use detailed examples, illustrations, evidence and logic to develop the topic;

6. Gather information from primary and secondary sources; write a report using that information; quote, paraphrase and summarize accurately; and cite sources properly;

7. Improve his or her own writing by restructuring, correcting errors and rewriting.

(C) Speaking, Listening and Viewing

As a result of education in grades K-12, each student should be able to:

1. Engage critically and constructively in an oral exchange of ideas;

2. Ask and answer questions correctly and concisely;

3. Understand spoken instructions and give spoken instructions to others;

4. Distinguish relevant from irrelevant information and the intent from the details of an oral message;

5. Identify and comprehend the main and subordinate ideas in speeches, discussions, audio and video presentations, and report accurately what has been presented;

6. Comprehend verbal and nonverbal presentations at the literal, inferential and evaluative levels;

7. Deliver oral presentations using a coherent sequence of thought, clarity of presentation, suitable vocabulary and length, and nonverbal communication appropriate for the purpose and audience.

(D) Quantitative Skills

As a result of education in grades K-12, each student should be able to:

1. Add, subtract, multiply and divide using whole numbers, decimals, fractions and integers;

2. Make and use measurements in both traditional and metric units to measure lengths, areas, volumes, weights, temperatures and times;

3. Use ratios, proportions and percents, powers and roots;

4. Understand spatial relationships and the basic concepts of geometry;

5. Make estimates and approximations, and judge the reasonableness of results;

6. Understand the basic concepts of probability and statistics;

7. Organize data into tables, charts and graphs, and read and interpret data presented in these forms.

8. Formulate and solve problems in mathematical terms.

(E) Reasoning and Problem Solving

As a result of education in grades K-12, each student should be able to:

1. Recognize and use inductive and deductive reasoning, recognize fallacies and examine arguments from various points of view;

2. Draw reasonable conclusions from information found in various sources, and defend his/her conclusions rationally;

3. Formulate and test predictions and hypotheses based on appropriate data;

4. Comprehend, develop and use concepts and generalizations;

5. Identify cause and effect relationships;

6. Identify and formulate problems;

7. Gather, analyze, synthesize and evaluate information pertinent to the problem;

8. Develop alternative solutions to problems, weigh relative risks and benefits, make logical decisions and verify results;

9. Use critical and creative thinking skills to respond to unanticipated situations and recurring problems.

(F) Learning Skills

As a result of education in grades K-12, each student should be able to:

1. Set learning goals and priorities consistent with stated objectives and progress made, and allocate the time necessary to achieve them;

2. Determine what is needed to accomplish a task and establish habits conducive to learning independently or with others;

3. Follow a schedule that accounts for both short and long term project accomplishment;

4. Locate and use a variety of sources of information including print and nonprint materials, computers and other technologies, interviews and direct observations;

5. Read or listen to specific information and take effective and efficient notes.

(U/A) Understandings and Applications

(A) The Arts: Creative and Performing

As a result of education in grades K-12, each student should be able to:

1. Express his/her own concepts, ideas and emotions through one or more of the arts (art, music, drama and dance);

2. Appreciate the importance of the arts in expressing and illuminating human experiences;

3. Understand that personal beliefs and societal values influence art forms and styles;

4. Identify the materials, processes and tools used in the production, exhibition and public performance of works of art, music, drama and dance;

5. Use and understand language appropriate to each art form when discussing, critiquing and interpreting works in the visual and performing arts;

6. Identify significant works and recognize the aesthetic qualities of art, music, drama and dance from different historical periods and cultures.

(B) Careers and Vocations

As a result of education in grades K-12, each student should be able to:

1. Demonstrate positive attitudes toward work, including acceptance of the necessity of making a living and an appreciation of the social value and dignity of work;

2. Demonstrate attitudes and habits (such as pride in good workmanship, dependability and regular attendance) and the employability skills and specialized knowledge that will make the individual a productive participant in economic life and a contributor to society;

3. Consider the range of occupations that will be personally satisfying and suitable to his/her skills, interests and aptitudes;

4. Identify, continue or pursue the education and training necessary for his/her chosen career/vocation;

5. Understand personal economics and its relationship to skills required for employment, promotion and financial independence;

6. Exhibit the interpersonal skills necessary for success in the workplace (such as working harmoniously as part of a team, and giving and taking direction).

(C) Cultures and Languages

As a result of education in grades K-12, each student should be able to:

1. Recognize characteristics common to all people, such as physical attributes, emotional responses, attitudes, abilities and aspirations;

2. Respect differences among people and recognize the pluralistic nature of United States society;

3. Demonstrate an understanding of other cultures and their roles in international affairs;

4. Analyze the structure of spoken and written language;

5. Recognize the commonalities and the differences that exist in the structure of languages;

6. Understand and communicate in at least one language in addition to English.

(D) History and Social Sciences

As a result of education in grades K-12, each student should be able to:

1. Recognize and analyze events, personalities, trends and beliefs that have shaped the history and culture of Connecticut, the United States and the world;

2. Demonstrate a knowledge of United States history and government and understand the duties, responsibilities and rights of United States citizenship;

3. Understand the basic concepts of economics;

4. Analyze and compare the political and economic beliefs and systems of the United States with those of other nations;

5. Apply major concepts drawn from the disciplines of history and the social sciences--anthropology, economics, geography, law and government, philosophy, political science, psychology and sociology--to hypothetical and real situations;

6. Demonstrate basic knowledge of world geography;

7. Apply critical thinking skills and knowledge from history and the social sciences to the decision-making process and the analysis of controversial issues in order to understand the present and anticipate the future;

8. Understand the roles played by various racial, ethnic and religious groups in developing the nation's pluralistic society;

9. Appreciate the mutual dependence of all people in the world and understand that our lives are part of a global community joined by economic, social, cultural and civic concerns.

(E) Literature

As a result of education in grades K-12, each student should be able to:

1. Understand that literature reflects and illuminates human experiences, motives, conflicts and values;

2. Understand the essential elements of poetry, drama, fiction and nonfiction;

3. Understand and appreciate selected literary masterpieces, both past and present, that manifest different value systems and philosophies;

4. Recognize symbolism, allegory and myth;

5. Identify literary themes and their implications;

6. Evaluate selected literary works and support each evaluation;

7. Enjoy reading as a lifelong pursuit.

(F) Mathematics

As a result of education in grades K-12, each student should be able to:

1. Understand that mathematics is a means of expressing quantifiable ideas;

2. Apply mathematical knowledge and skills to solve a broad array of quantitative, spatial and analytical problems;

3. Use mathematical skills and techniques to complete consumer and job-related tasks;

4. Select and use appropriate approaches and tools for solving problems, including mental computation, trial and error, paper and pencil, calculator and computer;

5. Use mathematical operations in describing and analyzing physical and social phenomena;

6. Demonstrate a quantitative sense by using numbers for counting, measuring, comparing, ordering, scaling, locating and coding;

7. Apply basic algebraic and geometric concepts to representing, analyzing and solving problems;

8. Use basic statistical concepts to draw conclusions from data.

(G) Physical Development and Health

As a result of education in grades K-12, each student should be able to:

1. Understand human growth and development, the functions of the body, human sexuality and the lifelong value of physical fitness;

2. Plan and implement a physical fitness program with a variety of conditioning exercises and/or leisure activities;

3. Understand the basic scientific principles which apply to human movement and physical activities;

4. Understand the role physical activities play in psychological and social development;

5. Understand and apply the basic elements of proper nutrition, avoidance of substance abuse, prevention and treatment of illness, and management of emotional stress;

6. Recognize the need for a safe and healthy environment, practice proper safety skills, and demonstrate a variety of basic life saving skills.

(H) Science and Technology

As a result of education in grades K-12, each student should be able to:

1. Understand and apply the basic principles, concepts and language of biology, chemistry, physics, earth and space science;

2. Understand the implications of limited natural resources, the study of ecology and the need for conservation;

3. Identify and design techniques for recognizing and solving problems in science, including the development of hypotheses and the design of experiments to test them--the gathering of data, presenting them in appropriate formats, and drawing inferences based upon the results;

4. Use observation and analysis of similarities and differences in the study of natural phenomena;

5. Demonstrate the ability to work with laboratory measuring, manipulating and sensing devices;

6. Understand the implications of existing and emerging technologies on our society and our quality of life, including personal, academic and work environments;

7. Recognize the potential and the limitations of science and technology in solving societal problems.